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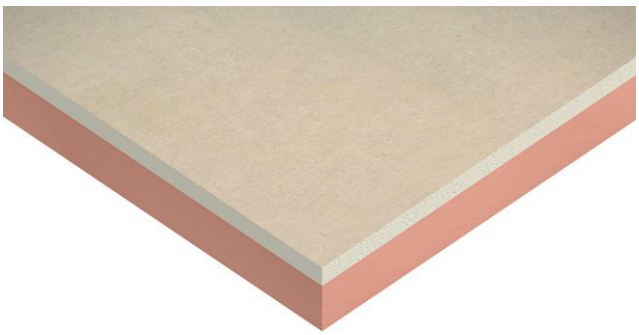
Kingspan Insulation BV

Kooltherm® K17



ISSUED 20.04.2023
VALID UNTIL 20.04.2028

THIRD PARTY VERIFIED
in accordance with EN 15804+A2, EN16783 and NBN/DTD B08-001

MODULES DECLARED
1 m^2 thermal insulation board with a thickness of 70 mm with an R_D-value of 3,30 $m^2 \cdot K/W$

Cradle to gate with options

A123	A4	A5	B2 B4	C	D
x	x	x		x	x

The intended use of this EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings. This EPD is only valid when registered on www.b-epd.be. The FPS Public Health cannot be held responsible for the information provided by the owner of the EPD.

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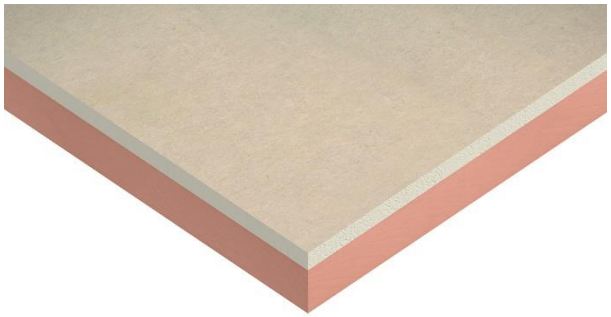
1 PRODUCT DESCRIPTION

1.1 Product name

Kooltherm® K17 Inner Wall Board

1.2 Product description and intended use



The Kingspan Kooltherm® K17 is a premium performance insulation board with a fibre-free rigid thermoset phenolic core, faced with a glass tissue facing on the backside and a composite foil based facing on the frontsite and autohesively bonded to the insulation core during manufacture. On the frontside a gypsum plasterboard (12,5mm) is bonded.

Phenolic foam is produced by the use of phenolic resin, a catalyst, additives and blowing agent. The cell structure is formed in the resin under the influence of heat released during the chemical reaction. Hereby, the blowing agent is incorporated into the material which forms a solid and very fine cell structure, which is nearly 100% closed.

This is a specific EPD from a single company, Kingspan insulation BV.



Kooltherm® K17 is suitable as inner wall insulation and can be used for renovation projects.

1.3 Reference flow / declared unit

1 m^2 thermal insulation with a thickness of 70 mm (and 12,5 mm gypsum board) which gives a R_D-value of 3,30 $m^2 \cdot K/W$.
The results in this environmental product declaration (EPD) can be converted to other thicknesses (and corresponding R_D value) using the formula in chapter 14 of this EPD.
The R_D-range of Kooltherm® K17 is 0,95 $m^2 \cdot K/W$ (20mm) to 9,5 $m^2 \cdot K/W$ (200mm).

Packaging is included .

The weight per reference flow is 10,55 kg.
The density of the product is 103,1 kg / m^3.

1.4 Installation

Materials for fixation and installation are not included. Regarding installation this EPD only includes the environmental impact related to the product itself: It also includes the loss of material during construction. The additional needed production, transport and end-of-life of the lost material during construction is included. The end-of-life of packaging material up to the end-of-waste state is also included.

For installing the product following scenarios are possible: Mechanical fixed and glued. This may lead to the need of additional products and materials for which the impact is not included in this EPD and which shall be taken into account at building level.
For questions about installation please contact our Technical Service Department: Techline.be@kingspan.com

In chapter 15 an overview is given on the qualitative assessment of the reversibility of Kooltherm® K17.

1.5 Composition and content

Components	Composition / content / ingredients	Quantity
Product	– PF core – Glass tissue facer – Gypsum plasterboard	– 2,214 kg – 0,140 kg – 8,1 kg
Fixation materials	Not included in the EPD ('as produced')	
Jointing materials	Not included in the EPD ('as produced')	
Treatments	NA	
Packaging	– PE-foil – EPS skids	– 0,0118 kg – 0,0441 kg

The product does not contain materials listed in the "Candidate list of Substances of Very High Concern for authorization" exceeding 0,1% by mass.

1.6 Reference service life

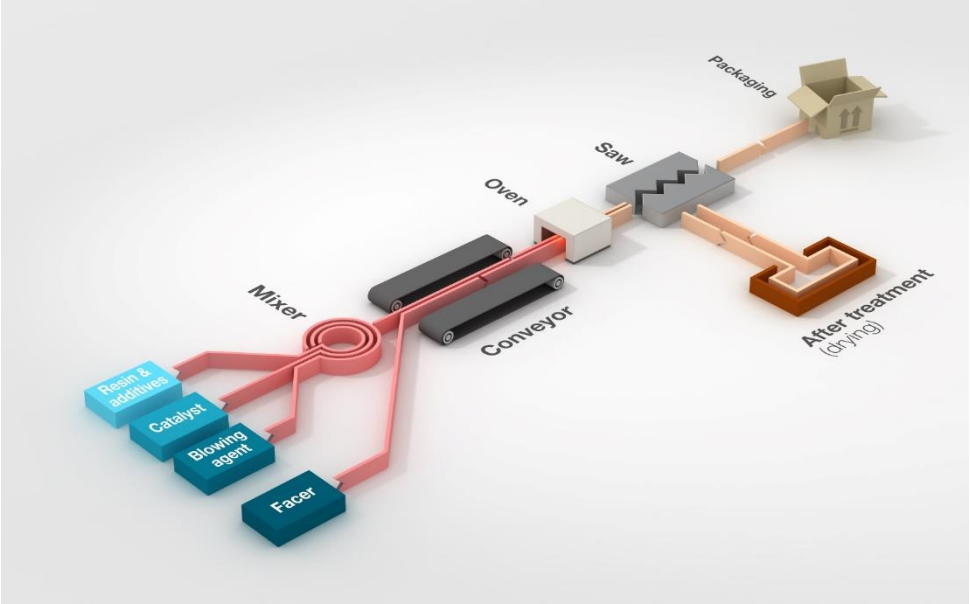
The reference service life is estimated at 75 years.
The RSL is based on the OVAM rapport "Technische levensduur van gebouwcomponenten" (published 30.11.2018).
The conditions under which this RSL is valid are as following: natural ageing conditions

1.7 Description of geographical representativity

The EPD is representative for the Belgian market.
Kooltherm® K17 is produced by Kingspan Insulation B.V. at the manufacturing facility in Tiel, the Netherlands.

1.8 Description of the production process and technology

Kingspan Kooltherm® is made through a manufacturing process in which a foam forms an insulating core between two facing elements. At the start of the process a mix of chemicals is added directly to the bottom layer of facing and then expands to meet the top layer of facing. As it dries, the foam becomes tacky and adheres itself to the facing, top and bottom. Once it has reached the necessary thickness the foam is cooked under pressure. It is then moved onto a secondary oven to cure and harden, becoming bright pink in colour. The insulation boards are then cut into the necessary sizes, packaged and sent to the loading bay for collection.



2 TECHNICAL DATA / PHYSICAL CHARACTERISTICS

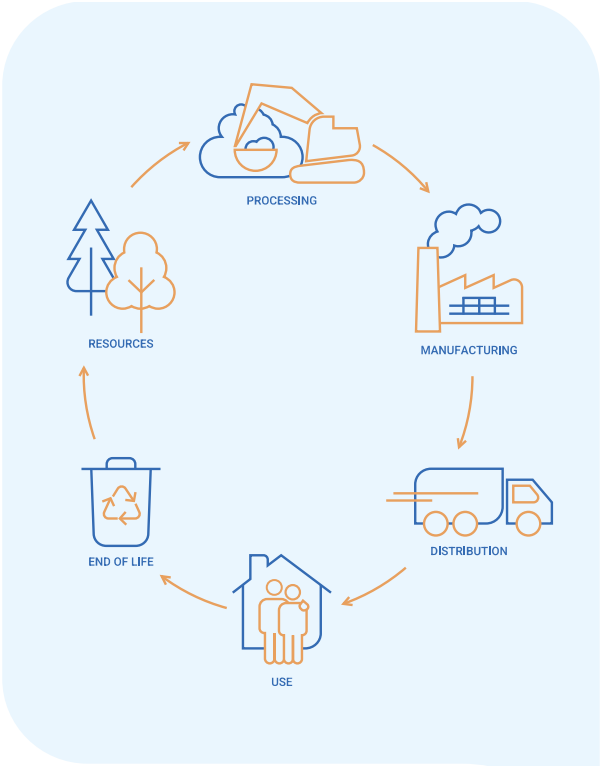
Technical property	Value	Unit	Comment
Thickness	70 + 12,5	mm	
Density	103,1	kg / m^3	
Thermal conductivity λ_d acc. to EN 13166	0,021	W/m·K	
R_D-value	3,30	m^2·K/W	

More technical properties can be found in the Declaration of Performance (DoP) of the product. DoP's of the products of Kingspan are available at: https://www.kingspan.com/blx/fr-be and https://www.kingspan.com/be/nl/

3 LCA-STUDY

3.1 Date of LCA-study

August 2022



3.2 Software

For the calculation of the LCA results, the software program SimaPro 9.1.1 has been used.

3.3 Information on allocation

Different types of Kooltherm® insulation boards are produced at the production plant in Tiel (NL). For the use of energy there is only data available for the total site. This data has been allocated to Kooltherm® K17 based on physical properties. Production waste was allocated similarly. .

3.4 Informatie on cut off

The total of neglected input flows per module is less than 5% of energy usage and mass as prescribed by EN15804+A2.

3.5 Information on excluded processes

Following processes were excluded for the inventory:

- Impact of infrastructures
- Consumables necessary for the functioning of the process, production, maintenance and end-of-life of equipment
- Environmental impacts caused by the personnel of the production plants are not included in the LCA, e.g. waste from the cafeteria and sanitary installations or environmental effects caused by commuter traffic. Heating or cooling of the plants in order to ensure a comfortable indoor climate for the personnel could not be distinguished during the data collection and is therefore included.

3.6 Information on biogenic carbon modelling

The total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging.

3.7 Information on carbon offsetting

Carbon offsetting is not allowed in the EN 15804 and hence not taken into account in the calculations.

3.8 Additional or deviating characterization factors

The characterization factors from EC-JRC were applied. No additional or deviating characterization factors were used.

3.9 Description of the variability

The declared unit in this EPD is 1 m^2 thermal insulation with a thickness of 70 mm (+ 12,5mm gypsum) which gives a R_D-value of 3,30 $m^2 \cdot K/W$. Kingspan Kooltherm® K17 can be produced in all thicknesses between 20 and 200mm (single layer product) and covers a R_D range of 0.95 – 9.50. The results in this EPD can be used to recalculate to other thicknesses / R_D-values. Where the foam-core is the scalable part and the facer the non-scalable part.

3.10 Specificity

The data used for the LCA are specific for this product which is manufactured by a single manufacturer in a single production site.

3.11 Period of data collection

Manufacturer specific data for the location Tiel have been collected for the year 2019.

3.12 Information on data collection

Company specific data for the product stage have been collected by Kingspan Insulation and were provided to Nibe (R<Think application)

3.13 Database used for background data

The Ecoinvent v3.6 database (2019) is used for background data

3.14 Energy mix

All electricity used during production comes from renewable sources.
By generating energy on-site with PV panels and with procured energy from fully certified renewable sources (Guarantees of Origin).

4 PRODUCTION SITES

Manufacturing site located in Tiel (the Netherlands)

5 SYSTEM BOUNDARIES

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒

X = included in the EPD
☐ = module not declared

6 POTENTIAL ENVIRONMENTAL IMPACTS PER REFERENCE FLOW

Foam core (without facer)

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
GWP total (kg CO2 equiv/FU)	3,50E+00	1,22E-01	1,22E+00	6,82E-02	2,80E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	4,71E-02	4,94E+00	1,28E-02	-1,15E+00
GWP fossil (kg CO2 equiv/FU)	8,54E-03	2,43E-04	-1,73E-03	3,63E-05	1,38E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	2,51E-05	4,44E-04	1,36E-05	-6,11E-03
GWP biogenic (kg CO2 equiv/FU)	3,49E+00	1,22E-01	1,23E+00	6,81E-02	2,80E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	4,71E-02	4,94E+00	1,28E-02	-1,14E+00
GWP luluc (kg CO2 equiv/FU)	8,81E-04	8,12E-05	2,10E-04	2,38E-05	3,10E-05	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,64E-05	8,66E-05	3,96E-07	-9,10E-04
ODP (kg CFC 11 equiv/FU)	2,58E-07	2,33E-08	1,09E-07	1,55E-08	9,97E-09	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,07E-08	3,42E-08	3,73E-10	-1,82E-07
AP (mol H+ eq/FU)	1,29E-02	1,26E-03	2,44E-03	2,78E-04	4,03E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,92E-04	1,29E-03	9,43E-06	-1,45E-03
EP - freshwater (kg (PO4)3- equiv/FU)	5,92E-05	2,35E-06	1,51E-05	5,35E-07	1,76E-06	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,70E-07	3,39E-06	1,33E-08	-9,85E-06
EP - marine (kg (PO4)3- equiv/FU)	2,29E-03	3,86E-04	4,82E-04	8,26E-05	8,99E-05	MND	MND	MND	MND	MND	MND	MND	0,00E+00	5,70E-05	5,37E-04	1,66E-05	-3,66E-04
EP - terrestrial (kg (PO4)3- equiv/FU)	2,84E-02	4,27E-03	5,48E-03	9,13E-04	1,05E-03	MND	MND	MND	MND	MND	MND	MND	0,00E+00	6,31E-04	5,81E-03	3,79E-05	-4,23E-03
POCP (kg Ethene equiv/FU)	1,07E-02	1,16E-03	2,15E-03	2,80E-04	3,60E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,93E-04	1,48E-03	1,34E-05	-1,32E-03
ADP Elements (kg Sb equiv/FU)	2,58E-05	2,12E-06	8,37E-06	1,84E-06	8,91E-07	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,27E-06	1,35E-06	9,22E-09	-1,11E-06
ADP fossil fuels (MJ/FU)	1,12E+02	1,78E+00	1,99E+01	1,03E+00	2,82E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	7,10E-01	1,02E+00	2,88E-02	-2,79E+01
WDP (m^3 water eq deprived /FU)	1,66E+00	8,85E-03	2,57E-01	2,86E-03	4,17E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,98E-03	5,93E-02	1,42E-04	-1,80E-01

Facer + gypsum

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
GWP total (kg CO2 equiv/FU)	2,15E+00	1,14E-01	0,00E+00	2,50E-01	5,41E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	9,77E-02	2,94E-01	4,89E-02	-3,74E-01
GWP fossil (kg CO2 equiv/FU)	-1,39E-01	4,51E-05	0,00E+00	1,33E-04	-2,78E-03	MND	MND	MND	MND	MND	MND	MND	0,00E+00	5,21E-05	2,09E-05	1,72E-04	3,45E-03
GWP biogenic (kg CO2 equiv/FU)	2,28E+00	1,14E-01	0,00E+00	2,50E-01	5,68E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	9,76E-02	2,94E-01	4,87E-02	-3,76E-01
GWP luluc (kg CO2 equiv/FU)	5,07E-03	4,49E-05	0,00E+00	8,74E-05	1,04E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,41E-05	2,53E-05	2,43E-05	-1,68E-03
ODP (kg CFC 11 equiv/FU)	1,93E-07	2,50E-08	0,00E+00	5,68E-08	5,24E-09	MND	MND	MND	MND	MND	MND	MND	0,00E+00	2,22E-08	4,52E-09	1,70E-08	-1,07E-08
AP (mol H+ eq/FU)	1,52E-02	9,23E-04	0,00E+00	1,02E-03	3,44E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,99E-04	2,21E-04	4,22E-04	-2,65E-03
EP - freshwater (kg (PO4)3- equiv/FU)	1,05E-04	1,09E-06	0,00E+00	1,96E-06	2,17E-06	MND	MND	MND	MND	MND	MND	MND	0,00E+00	7,67E-07	1,19E-06	5,79E-07	-1,15E-05
EP - marine (kg (PO4)3- equiv/FU)	3,15E-03	2,91E-04	0,00E+00	3,03E-04	7,52E-05	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,18E-04	5,51E-05	1,52E-04	-4,02E-04
EP - terrestrial (kg (PO4)3- equiv/FU)	3,43E-02	3,22E-03	0,00E+00	3,35E-03	8,22E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,31E-03	6,19E-04	1,67E-03	-4,50E-03
POCP (kg Ethene equiv/FU)	8,76E-03	8,96E-04	0,00E+00	1,03E-03	2,14E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	4,01E-04	1,66E-04	4,77E-04	-1,31E-03
ADP Elements (kg Sb equiv/FU)	3,95E-04	2,71E-06	0,00E+00	6,77E-06	8,03E-06	MND	MND	MND	MND	MND	MND	MND	0,00E+00	2,64E-06	6,82E-07	3,97E-07	4,70E-04
ADP fossil fuels (MJ/FU)	3,04E+01	1,70E+00	0,00E+00	3,77E+00	7,05E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,47E+00	3,70E-01	1,30E+00	-3,46E+00
WDP (m^3 water eq deprived /FU)	7,23E-01	5,80E-03	0,00E+00	1,05E-02	1,57E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	4,10E-03	6,00E-03	4,52E-02	5,15E-02

GWP TOTAL = TOTAL GLOBAL WARMING POTENTIAL (CLIMATE CHANGE); GWP-LULUC = GLOBAL WARMING POTENTIAL (CLIMATE CHANGE) LAND USE AND LAND USE CHANGE; ODP = OZONE DEPLETION POTENTIAL; AP = ACIDIFICATION POTENTIAL FOR SOIL AND WATER; EP = EUTROPHICATION POTENTIAL; POCP = PHOTOCHEMICAL OZONE CREATION; ADPE = ABIOTIC DEPLETION POTENTIAL – ELEMENTS; ADPF = ABIOTIC DEPLETION POTENTIAL – FOSSIL FUELS; WDP = WATER USE (WATER (USER) DEPRIVATION POTENTIAL, DEPRIVATION-WEIGHTED WATER CONSUMPTION)

7 RESOURCE USE

Foam core (without facer)

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PERE (MJ/FU, net calorific value)	1,70E+00	6,22E-02	5,66E+00	1,45E-02	1,54E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,00E-02	2,69E-02	1,22E-03	-1,34E+00
PERM (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT (MJ/FU, net calorific value)	1,70E+00	6,22E-02	5,66E+00	1,45E-02	1,56E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,00E-02	9,14E-02	1,45E-03	-1,34E+00
PENRE (MJ/FU, net calorific value)	1,17E+02	1,89E+00	1,94E+01	1,09E+00	2,98E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	7,53E-01	2,77E+00	1,04E-01	-2,90E+01
PENRM (MJ/FU, net calorific value)	5,26E+01	0,00E+00	4,36E+00	0,00E+00	1,14E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-6,57E-01
PENRT (MJ/FU, net calorific value)	1,69E+02	1,89E+00	2,37E+01	1,09E+00	4,05E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	7,53E-01	1,08E+00	3,04E-02	-2,96E+01
SM (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW (m^3 water eq/FU)	6,71E-01	3,96E-04	3,19E-02	1,08E-04	1,42E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	7,47E-05	2,42E-03	3,25E-05	-5,12E-03

Facer + gypsum

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PERE (MJ/FU, net calorific value)	9,73E+00	2,05E-02	0,00E+00	5,32E-02	2,07E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	2,08E-02	2,57E-02	5,77E-01	-5,88E-01
PERM (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT (MJ/FU, net calorific value)	9,73E+00	2,05E-02	0,00E+00	5,32E-02	1,97E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	2,08E-02	3,93E-02	3,49E-02	-4,63E-01
PENRE (MJ/FU, net calorific value)	3,24E+01	1,80E+00	0,00E+00	4,00E+00	8,35E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,56E+00	1,54E+00	4,45E+00	-4,88E+00
PENRM (MJ/FU, net calorific value)	6,16E-02	0,00E+00	0,00E+00	0,00E+00	1,23E-03	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT (MJ/FU, net calorific value)	3,24E+01	1,80E+00	0,00E+00	4,00E+00	7,51E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,56E+00	3,93E-01	1,37E+00	-3,66E+00
SM (kg/FU)	8,88E-02	0,00E+00	0,00E+00	0,00E+00	1,78E-03	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF (MJ/FU, net calorific value)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW (m^3 water eq/FU)	3,50E-02	1,98E-04	0,00E+00	3,97E-04	7,34E-04	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,55E-04	2,78E-04	1,10E-03	-2,42E-04

PERE = USE OF RENEWABLE PRIMARY ENERGY EXCLUDING RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PERM = USE OF RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PERT = TOTAL USE OF RENEWABLE PRIMARY ENERGY RESOURCES; PENRE = USE OF NON-RENEWABLE PRIMARY ENERGY EXCLUDING NON-RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PENRM = USE OF NON-RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS; PENRT = TOTAL USE OF NON-RENEWABLE PRIMARY ENERGY RESOURCES; SM = USE OF SECONDARY MATERIAL; RSF = USE OF RENEWABLE SECONDARY FUELS; NRSF = USE OF NON-RENEWABLE SECONDARY FUELS; FW = NET USE OF FRESH WATER

8 WASTE CATEGORIES & OUTPUT FLOWS

Foam core (without facer)

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (kg/FU)	3,27E-05	3,83E-06	2,45E-05	2,69E-06	1,53E-06	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,86E-06	3,63E-06	3,49E-08	-2,03E-05
Non-hazardous waste disposed (kg/FU)	2,29E-01	7,18E-02	7,66E-02	4,91E-02	1,88E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,39E-02	4,27E-02	1,11E-01	-2,85E-02
Radioactive waste disposed (kg/FU)	4,75E-05	1,15E-05	1,09E-05	7,00E-06	2,07E-06	MND	MND	MND	MND	MND	MND	MND	0,00E+00	4,84E-06	3,74E-06	1,97E-07	-1,52E-04
Components for re-use (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,57E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy (MJ/FU)	0,00E+00	0,00E+00	-6,00E-01	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,57E+01

Facer + gypsum

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (kg/FU)	4,44E-04	4,10E-06	0,00E+00	9,88E-06	2,41E-05	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,86E-06	7,53E-04	1,91E-06	9,46E-04
Non-hazardous waste disposed (kg/FU)	3,72E-01	9,99E-02	0,00E+00	1,80E-01	1,41E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	7,04E-02	1,14E-02	6,49E+00	-7,22E-02
Radioactive waste disposed (kg/FU)	1,18E-04	1,12E-05	0,00E+00	2,57E-05	3,01E-06	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,00E-05	2,01E-06	9,31E-06	-4,27E-06
Components for re-use (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,47E-02	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	1,73E+00	0,00E+00	0,00E+00
Materials for energy recovery (kg/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy (MJ/FU)	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,79E-02

9 IMPACT CATEGORIES ADDITIONAL TO EN 15804

Foam core (without facer)

	Production			Construction process stage		Use stage							End-of-life stage				
	A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
PM (disease incidence)	1,29E-07	9,36E-09	1,80E-08	4,75E-09	3,91E-09	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,28E-09	8,90E-09	1,93E-10	-6,63E-09
IRHH (kg U235 eq/FU)	1,03E-01	8,26E-03	1,07E-02	4,49E-03	3,02E-03	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,10E-03	4,15E-03	1,54E-04	-1,75E-01
ETF (CTUe/FU)	9,72E+01	1,63E+00	1,08E+01	8,22E-01	2,78E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	5,68E-01	1,34E+01	5,54E-02	-5,19E+00
HTCE (CTUh/FU)	2,47E-09	7,52E-11	4,36E-10	2,31E-11	1,00E-10	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,60E-11	9,79E-10	7,44E-13	-1,35E-10
HTnCE (CTUh/FU)	3,04E-08	1,76E-09	7,93E-09	8,97E-10	1,24E-09	MND	MND	MND	MND	MND	MND	MND	0,00E+00	6,19E-10	9,37E-09	2,29E-11	-2,48E-09
Land Use Related impacts (dimensionless)	-5,32E+01	1,29E+00	-6,44E-01	7,08E-01	-9,68E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	4,89E-01	3,43E-01	6,70E-02	-3,80E+00

Facer + gypsum

		Production			Construction process stage		Use stage							End-of-life stage				
		A1 Raw material	A2 Transport	A3 manufacturing	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
	PM (disease incidence)	1,51E-07	9,67E-09	0,00E+00	1,74E-08	3,56E-09	MND	MND	MND	MND	MND	MND	MND	0,00E+00	6,80E-09	2,37E-09	8,56E-09	-3,43E-08
	IRHH (kg U235 eq/FU)	1,44E-01	7,12E-03	0,00E+00	1,65E-02	3,33E-03	MND	MND	MND	MND	MND	MND	MND	0,00E+00	6,43E-03	2,01E-03	7,06E-03	-2,95E-03
	ETF (CTUe/FU)	7,24E+01	1,48E+00	0,00E+00	3,02E+00	1,62E+00	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,18E+00	1,56E+00	4,51E+00	-9,74E+00
	HTCE (CTUh/FU)	1,80E-09	5,10E-11	0,00E+00	8,49E-11	3,95E-11	MND	MND	MND	MND	MND	MND	MND	0,00E+00	3,31E-11	7,15E-11	2,07E-11	-5,12E-10
	HTnCE (CTUh/FU)	4,96E-08	1,60E-09	0,00E+00	3,29E-09	1,09E-09	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,29E-09	1,35E-09	5,74E-10	-7,04E-09
	Land Use Related impacts (dimensionless)	3,29E+01	1,38E+00	0,00E+00	2,60E+00	7,56E-01	MND	MND	MND	MND	MND	MND	MND	0,00E+00	1,01E+00	3,06E-01	2,18E+00	-4,06E-02

HTCE = HUMAN TOXICITY – CANCER EFFECTS; HTNCE = HUMAN TOXICITY – NON CANCER EFFECTS; ETF = ECOTOXICITY – FRESHWATER; (POTENTIAL COMPARATIVE TOXIC UNIT)
PM = PARTICULATE MATTER (POTENTIAL INCIDENCE OF DISEASE DUE TO PM EMISSIONS);
IRHH = IONIZING RADIATION – HUMAN HEALTH EFFECTS (POTENTIAL HUMAN EXPOSURE EFFICIENCY RELATIVE TO U235);

9.1 Environmental impact categories explained

 Global Warming Potential	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1. It is split up in 4: – Global Warming Potential total (GWP-total) which is the sum of GWP-fossil, GWP-biogenic and GWP-luluc – Global Warming Potential fossil fuels (GWP-fossil) : The global warming potential related to greenhouse gas (GHG) emissions to any media originating from the oxidation and/or reduction of fossil fuels by means of their transformation or degradation (e.g. combustion, digestion, landfilling, etc). – Global Warming Potential biogenic (GWP-biogenic) : The global warming potential related to carbon emissions to air (CO2, CO and CH4) originating from the oxidation and/or reduction of aboveground biomass by means of its transformation or degradation (e.g. combustion, digestion, composting, landfilling) and CO2 uptake from the atmosphere through photosynthesis during biomass growth - i.e. corresponding to the carbon content of products, biofuels or above ground plant residues such as litter and dead wood. – Global Warming Potential land use and land use change (GWP-luluc): The global warming potential related to carbon uptakes and emissions (CO2, CO and CH4) originating from carbon stock changes caused by land use change and land use. This sub-category includes biogenic carbon exchanges from deforestation, road construction or other soil activities (including soil carbon emissions).
 Ozone Depletion	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), Which break down when they reach the stratosphere and then catalytically destroy ozone molecules.
 Acidification potential	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.
 Eutrophication potential	The potential to cause over-fertilization of water and soil, which can result in increased growth of biomass and following adverse effects. It is split up in 3: – Eutrophication potential - freshwater: The potential to cause over-fertilization of freshwater, which can result in increased growth of biomass and following adverse effects. – Eutrophication potential - marine: The potential to cause over-fertilization of marine water, which can result in increased growth of biomass and following adverse effects. – Eutrophication potential - terrestrial: The potential to cause over-fertilization of soil, which can result in increased growth of biomass and following adverse effects.
 Photochemical ozone creation	Chemical reactions brought about by the light energy of the sun creating photochemical smog. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.
 Abiotic depletion potential for non-fossil ressources	Consumption of non-renewable resources, thereby lowering their availability for future generations. Expressed in comparison to Antimonium (Sb). The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
 Abiotic depletion potential for fossil ressources	Measure for the depletion of fossil fuels such as oil, natural gas, and coal. The stock of the fossil fuels is formed by the total amount of fossil fuels, expressed in Megajoules (MJ). The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

Ecotoxicity for aquatic fresh water	The impacts of chemical substances on ecosystems (freshwater). The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Human toxicity (carcinogenic effects)	The impacts of chemical substances on human health via three parts of the environment: air, soil and water. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Human toxicity (non-carcinogenic effects)	The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Particulate matter	Accounts for the adverse health effects on human health caused by emissions of Particulate Matter (PM) and its precursors (NOx, SOx, NH3)
Resource depletion (water)	Accounts for water use related to local scarcity of water as freshwater is a scarce resource in some regions, while in others it is not. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.
Ionizing radiation - human health effects	This impact category deals mainly with the eventual impact on human health of low dose ionizing radiation of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.
Land use related impacts	The indicator is the “soil quality index” which is the result of an aggregation of following four aspects: – Biotic production – Erosion resistance – Mechanical filtration – Groundwater The aggregation is done based on a JRC model. The four aspects are quantified through the LANCA model for land use. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

10 DETAILS OF THE UNDERLYING SCENARIOS USED TO CALCULATE THE IMPACTS

10.1 A1 - raw material supply

This module takes into account the extraction and processing of all raw materials and energy which occur upstream to the studied manufacturing process.

10.2 A2 – transport to the manufacturer

The raw materials are transported to the manufacturing site.

10.3 manufacturing

This module takes into account the production process.

10.4 A4 – transport to the building site

Fuel type and consumption of vehicle or vehicle type used for transport	Truck 16-32 ton 0,256 l diesel / km		
Distance	180 km		
Capacity utilisation (including empty returns)	50%		
Bulk density of transported products	Ecoinvent		
Volume capacity utilisation factor	Ecoinvent		

Kooltherm® K17 is only sold on a project basis. Kooltherm will therefore only be delivered directly to construction sites.

The following transport scenario applies:

- 100% directly to the construction site over 180 km with a 16-32 ton lorry (ecoinvent record: 'Transport, freight, lorry 16-32 metric ton, EURO5 {RER}| transport, freight, lorry 16-32 metric ton, EURO5 | Cut-off, U')

10.5 A5 – installation in the building

At the construction site, packaging materials are released. Also 2% material losses have been taken into account

Parts of the installation	quantity	Description
Material losses	0,211 kg Kooltherm K17	THE QUANTITY OF MATERIAL LOST DUE TO CUTTING IT IN THE RIGHT SHAPE
Packaging	0,0118 kg PE foil 0,0441 kg EPS Skids	THE PACKAGING WASTE AT THE CONSTRUCTION SITE

10.6 C: End of life

The default scenario for synthetic isolation materials in the NBN/DTD B08-001 states 5% of the waste treatment consists of landfilling, the other 95% consists of incineration and/or energetic valorisation.
After incineration the aluminium will be recycled from the bottom ash (based on sustainability report of Indaver: samen werken aan een circulaire economie, duurzaamheidsrapport 2021).

The default scenario for metals (non-ferro) in the NBN/DTD B08-001 states 5% of the waste treatment consists of landfilling, the other 95% consists of recycling.

Module C2 – Transport to waste processing

Type of vehicle (truck/boat/etc.)	Fuel consumption (litres/km)	Distance (km)	Capacity utilisation (%)	Density of products (kg/m3)	Assumptions
Truck 16-32 ton	0,256 l diesel/ km	30	50%	Ecoinvent scenario	Ecoinvent scenario
Truck 16-32 ton	0,256 l diesel/ km	50	50%	Ecoinvent scenario	Ecoinvent scenario
Truck 16-32 ton	0,256 l diesel/ km	10	50%	Ecoinvent scenario	Ecoinvent scenario

End-of-life modules – C3 and C4

Parameter	Value (kg)
Wastes collected separately	0
Wastes collected as mixed construction waste	10,55
Waste for re-use	0
Waste for recycling	1,73
Waste for energy recovery	2,22
Waste for final disposal	6,60

10.7 D – Benefits and loads beyond the system boundaries

QUANTITATIVE DESCRIPTION OF THE LOADS BEYOND THE SYSTEM BOUNDARIES	No loads
QUANTITATIVE DESCRIPTION OF THE BENEFITS BEYOND THE SYSTEM BOUNDARIES	Avoided production of 11,5 MJ of heat using natural gas Avoided production of 5,8 MJ of Belgian electricity mix

11 RELEASE OF DANGEROUS SUBSTANCES TO INDOOR AIR, SOIL AND WATER DURING THE USE STAGE

11.1 Indoor air

Not applicable

11.2 Soil and water

The product does not come in contact with soil or water.

12 DEMONSTRATION OF VERIFICATION

EN 15804+A2 serves as the core PCR

Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010
Internal ☐ External ☒

Third party verifier:
Vinçotte nv
Ramses Sterckx
Jan Olieslagerslaan 35 1800 Vilvoorde
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13 LCA INTERPRETATION

All impact categories are mainly determined by the raw materials supply in A1. For GWP (and to less extend also the values for ODP, FAETP and MAETP) also the incineration emissions at the end of life have a significant environmental impact. The potential credits for thermal and electrical energy are declared in module D and result in negative values for most of the impact categories.

14 APPLICATION UNIT

This paragraph gives information on Kooltherm® K17 and how the reference flow and table with impacts relate to different applications.

Application: inner walls
Thickness range: 20 – 200 mm
Ratio to the declared unit of 1 m^2 (based on the standard thickness): 1

The results of chapter 6 to 9 in this EPD can be converted to other thicknesses (and corresponding R_D value) using the following formula:

LCA results new thickness = LCA result foam core 70 mm * (new thickness (mm) / 70 mm) + LCA result facer and gypsum

15 ADDITIONAL INFORMATION ON REVERSIBILITY

Description	Type of fixing	Level of reversibility	Simplicity of disassembly	Speed of disassembly	Ease of handling	Robustness of material
Insulation for indoor applications	Mechanically fixed	Reversible connections with light repairable damage	Simple, no specific tools required	Rather speedy disassembly	Easy to manipulate by hand: one worker should be sufficient	Disassembly is possible but can cause damage to the material due to the type of assembly or fixing used.

16 BIBLIOGRAPHY

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ISO 14044:2006: Environmental Management-Life Cycle Assessment-Requirements and guidelines.

ISO 14025:2006: Environmental labels and Declarations-Type III Environmental Declarations-Principles and procedures.

NBN EN 15804+A2:2019

NBN/DTD B 08-001 (BE-PCR)

EN 16783:2017 Thermal insulation products - Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations

EN 13166:2012+A2:2016: Thermal insulation products for buildings. Factory made phenolic foam (PF) products.

OVAM: Technische levensduur van gebouwcomponenten publicatiedatum / 30.11.2018

Indaver: samen werken aan een circulaire economie, duurzaamheidsrapport 2021

General information

Owner of the EPD, Responsible for the data, LCA and information

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Version NIBE's EPD Application: v2.0
Project report: EPD-NIBE-20220801-29164

Verifier

Ramses Sterckx Vinçotte nv
Date of verification: 25.01.2023
External independent verification of the declaration and data according to EN ISO 14025 and relevant PCR documents

Comparing EPDs is not possible unless they are conform to the same PCR and taking into account the building context.
The program operator cannot be held responsible for the information supplied by the owner of the EPD nor LCA practitioner.

B-EPD program operator
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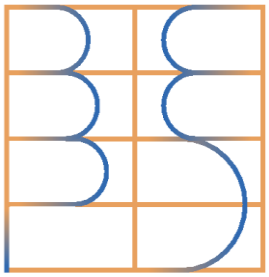

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